

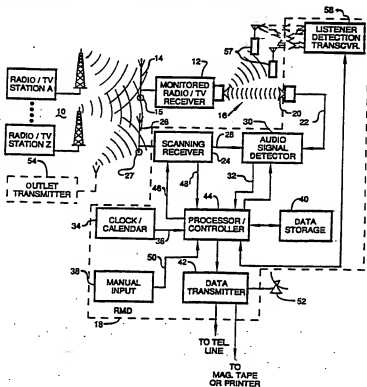


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b>  <b>H04B 17/00, H04H 9/00</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 91/11062</b>  <b>(43) International Publication Date:</b> <b>25 July 1991 (25.07.91)</b>
<b>(21) International Application Number:</b> PCT/US91/00310 <b>(22) International Filing Date:</b> 15 January 1991 (15.01.91)  <b>(30) Priority data:</b> 466,815                   18 January 1990 (18.01.90)   US  <b>(71)(72) Applicants and Inventors:</b> YOUNG, Alan, M. [US/US]; 21600 Summit Road, Los Gatos, CA 95030 (US); BLATT, Elliott, D. [US/US]; 128 1/2 Main Street, Seal Beach, CA 90740 (US).  <b>(74) Agent:</b> HAMRICK, Claude, A., S.; Rosenblum, Parish & Bacigalupi, 160 W. Santa Clara Street, 15th Floor, San Jose, CA 95113 (US).		<b>(81) Designated States:</b> AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).  <b>Published</b> <i>With international search report.</i>

**(54) Title:** METHOD AND APPARATUS FOR BROADCAST MEDIA AUDIENCE MEASUREMENT**(57) Abstract**

A method and apparatus for broadcast media audience measurement including a receiver (24) for scanning and sampling each broadcast frequency within a predetermined band and outputting sampled audio frequency signals, a microphone (20) for "listening" to sound emanating from a monitored broadcast receiver (12), an audio frequency signal detector (30) for comparing the scanned audio signals to the audio output developed by the microphone and for indicating a match, a clock/calendar (34) for generating time and date signals, a processor/controller (44) for causing the receiver to perform a frequency scan and for recording in a storage means (40) information including the identity of the matching station and the date and time of the match, and for causing the stored information to be transmitted to a remote location via suitable communication media. Additionally, mobile systems may also include proximity detection capability for identifying listener visits.



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## Specification

METHOD AND APPARATUS FOR BROADCAST  
MEDIA AUDIENCE MEASUREMENTBACKGROUND OF THE INVENTIONField of the Invention

The present invention relates generally to broadcast media audience measurement and more particularly to an improved method and apparatus for passively monitoring the listening habits of a user of an AM/FM or television receiver without requiring any physical interaction or interconnection between the monitored device or the listener/viewer.

Discussion of the Prior Art

There is an established need for methods and apparatus for enabling broadcasters and advertisers to measure the number of persons viewing or listening to each television or radio station in a given geographical area or demographic group as well as the particular programs to which they listen or view. Broadcasters need such information in order to establish advertising rates, while advertisers need the information to decide the stations and times during which they should broadcast their advertising to best reach particular demographic groups.

Prior art receiver monitors heretofore could only test individual AM or FM radio receivers, or television receivers,

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1 but not both. Some systems require the transmission of a  
2 coded signal from a broadcast station's transmitter and  
3 detection of the coded signal at the receiver unit to  
4 determine when the particular receiver is tuned to the given  
5 station. Other systems require direct electrical or  
6 mechanical connections to the receiver unit (such as shaft  
7 encoders or position sensors on the tuner knob or station  
8 selector) to determine the station to which the receiver is  
9 tuned. Still other systems require a specially controlled  
10 test room in which listeners are under direct observation  
11 using "headsets" or other intrusive means to determine which  
12 program or station each participant selects. Other methods  
13 require the use of handwritten questionnaires, diaries or  
14 orally obtained interview responses to gather the needed  
15 data.

16 Examples of such methods and systems are disclosed in  
17 the United States Patents to Watanabe 3,803,349; Kemp  
18 4,618,995; Lurie 4,626,904; Roberts et al 4,642,685; Heller,  
19 III 4,652,915; McKenna et al 4,658,290; Weinblatt 4,695,879;  
20 Kiewit et al 4,697,209; Weinblatt 4,718,106; Fulmer  
21 4,723,302; Von Kohorn 4,745,468; Lem 4,750,034; Weinblatt  
22 4,837,851; Gall et al 4,847,685; Welsh 4,857,999; and Lu  
23 4,858,000. Each of the methods and systems disclosed in the  
24 above patents is subject to one or more serious shortcomings  
25 that limit their practicality, objectivity and accuracy.

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1 Objects of the Present Invention

2 It is therefore an object of the present invention to  
3 provide an improved means to determine the station to which  
4 a broadcast receiver is tuned at particular points in time.

5 Another object of the present invention is to provide  
6 an improved means to determine the station to which a  
7 receiver is tuned at particular times without having any  
8 electrical or mechanical interconnections to the user or  
9 receiver under test.

10 Yet another object of the present invention is to  
11 provide an improved means to determine the station to which  
12 a broadcast receiver is tuned without having to transmit any  
13 "cue" or code signal to the receiver from a particular  
14 station's transmitter.

15 Still another object of the present invention is to  
16 provide an improved method for determining the broadcast  
17 station to which a TV or radio receiver is tuned at various  
18 times of the day.

19 A further object of the present invention is to provide  
20 an improved means to determine a station to which a broadcast  
21 receiver is tuned regardless of whether the receiver is  
22 installed in a stationary structure or a mobile facility.

23 An additional object of the present invention is to  
24 provide a means for determining when a vehicle having a  
25 monitored mobile receiver has "visited" a particular  
26 location.

27 Yet another object of the present invention is to  
28 provide a means for determining which individuals of several

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1 are listening to a particular receiver at any particular  
2 time.  
3

4 SUMMARY OF THE PRESENT INVENTION

5 A "Method and Apparatus for Broadcast Media Audience  
6 Measurement" including a receiver for sequentially sampling  
7 each broadcast frequency within a predetermined band and  
8 outputting sampled audio frequency signals, a microphone for  
9 "listening" to sound emanating from a monitored broadcast  
10 receiver, an audio signal detector for comparing the scanned  
11 audio signals to the audio output developed by the microphone  
12 and for indicating a match therebetween, a clock/calendar for  
13 generating time and date signals, a processor/controller for  
14 causing the receiver to perform a frequency scan and for  
15 responding to the detected match signal to record in a data  
16 storage means the identity of the matching station (or  
17 frequency) and the date and time of the match, and for  
18 causing the stored information to be periodically transmitted  
19 to a remote location via telephone line or other suitable  
20 electronic communication media or to be stored in other  
21 memory means or in hard copy using magnetic storage media  
22 or a printer. The system may also include a keyboard for  
23 manual input to accommodate preference polling, merchandise  
24 purchase data entry or other user interaction. Additionally,  
25 mobile systems may also include proximity detection  
26 capability for identifying listener visits to particular  
27 advertiser facilities or the like. Similarly, means may be  
28 provided for determining which of several possible

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1 individuals may be listening to a particular receiver at a  
2 particular time.

3 Among the numerous advantages of the present invention  
4 is that insofar as the listener/viewer and the monitored  
5 radio/TV receiver is concerned, the apparatus is entirely  
6 passive and requires no physical interconnection or  
7 interrelationship therewith.

8 Another advantage of the present invention is that it  
9 may be implemented to automatically report the results of  
10 its operation at any desired interval or on a real time basis  
11 without user interaction.

12 Still another advantage of the present invention is that  
13 it may be combined with special low power transmitting means  
14 to report user visitation to particular locations or  
15 facilities.

16 These and other objects and advantages of the present  
17 invention will no doubt become apparent to those of ordinary  
18 skill in the art after having read the following detailed  
19 description which makes reference to the several figures of  
20 the drawing.

21

22

#### IN THE DRAWING

23 Fig. 1 is a block diagram generally illustrating the  
24 principal components of the present invention together with  
25 their relationships to various broadcast transmitters and  
26 the monitored radio/TV receiver;

27 Fig. 2 is a block diagram illustrating one  
28 implementation of the audio signal detector included in the

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1 apparatus depicted in Fig. 1 of the drawing; and  
2 Fig. 3 is a block diagram illustrating how a single  
3 embodiment of the present invention can be used to monitor  
4 remotely located receivers.

5  
6 BRIEF DESCRIPTION OF PREFERRED EMBODIMENT

7 Referring now to Fig. 1 of the drawing, a plurality of  
8 radio/TV stations and their broadcast transmitters are  
9 indicated at 10, and a monitored radio/TV receiver and its  
10 receiving antenna are depicted at 12 and 14 respectively.  
11 The sonic output of receiver 12 is suggested by the waves  
12 16.

13 Shown within the dashed lines 18 is a Receiver  
14 Monitoring Device which will hereinafter be referred to as  
15 RMD 18. As indicated, RMD 18 includes a microphone 20 for  
16 picking up sound emanating from the receiver 12 and  
17 developing an audio signal on line 22, and a  
18 frequency/channel/station scanning receiver 24 and associated  
19 antenna 26 for detecting RF signals generated by the various  
20 stations 10 and for developing audio outputs on line 28  
21 corresponding to the voice and/or music signals broadcast to  
22 the public. As used herein, the terms broadcast signal and  
23 broadcast frequency refer to information-carrying signals of  
24 any type transmitted over any suitable transmission medium.  
25 Note that as alternatives to the antennas 14 and 26, coaxial  
26 connection from a satellite receiving dish or cable system  
27 may be made at "Tee" connections 15 and 27.



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1           The system also includes an audio signal detector 30  
2   for comparing the audio signals input on lines 22 and 28 and  
3   for developing a "match" signal on line 32 when the audio  
4   output of receiver 24 matches the audio output of receiver  
5   12. This is to say that as scanning receiver 24 is stopped  
6   from one broadcast frequency to another, if the audio portion  
7   of the broadcast signal matches the audio output of the  
8   monitored receiver 12, a signal indicating the detection of  
9   the match will be generated on line 32.

10          RMD 18 further includes a clock/calendar 34 for  
11   outputting date and time signals on line 36, a manual input  
12   pad or keyboard 38, a data storage means 40 typically  
13   comprising ROM and RAM memory devices, and a data transmitter  
14   42.       The heart of RMD 18 is an electronic  
15   processor/controller 44 which is preprogrammed to control  
16   the overall operation of the device. One important function  
17   is that it generates signals on line 46 for causing scanning  
18   receiver 24 to either sequentially scan a particular spectrum  
19   of broadcast frequencies or to scan preselected discrete  
20   frequencies in a particular order or to scan preselected  
21   discrete frequencies at preselected times. Controller 44  
22   also receives the match signal on line 32 and in response  
23   thereto causes a station identifier signal fed back on line  
24   48 and the date and time signal input on line 36 to be stored  
25   in data storage means 40. The duration of time each station  
26   is being viewed or listened to can be obtained from data  
27   accumulated from repeated scans across the scanned frequency  
28   band. Likewise, the times and periods during which no

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1 station is listened to can be obtained in the same way.  
2 In addition, controller 44 may also cause a manual input  
3 signal developed on line 50 to likewise be stored in data  
4 storage means 40. Such manual input might be as basic as a  
5 simple yes or no preference polling, or could involve the  
6 input of opinion statements, merchandise purchase entries,  
7 etc. It will be understood that either new sampled data or  
8 analyzed and processed data can be stored in data storage  
9 means 40 and/or transmitted via transmitter 42.

10 Controller 44 can also be programmed to cause  
11 information (including unit and/or location information)  
12 stored in memory means 40 to be read out to the data  
13 transmitter 42 for transmission via a radio wave or microwave  
14 facility 52 to a remote data gathering center.  
15 Alternatively, the data can be transmitted to the center or  
16 any other specified terminal via a modem-linked telephone  
17 line, or can be fed to a magnetic tape or disk drive, or  
18 printer to produce a "hard copy" which can be physically  
19 delivered to the center. As will be further explained below,  
20 RMD 18 also has the capability of indicating when the person  
21 or vehicle carrying the RMD is in the vicinity of a  
22 particular retail outlet or other location having an  
23 identifying outlet transmitter 54.

24 Another capability of the present invention is its  
25 ability to not only identify the station to which a  
26 particular receiver is tuned but also to determine which of  
27 several identifiable listeners are present in the vicinity  
28 of the monitored receiver. This may be accomplished as

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1 indicated in Fig. 1 by requiring that the listeners have  
2 attached to their person, or carry in one way or another, a  
3 small transponder device such as that depicted at 57. Such  
4 devices respond to an RF, sonic or optical signal generated  
5 by a listener detecting transceiver 58 forming a part of RMD  
6 18 and return a signal which may be used to identify the  
7 party associated with the responding device. For example,  
8 each individual within a monitored household might be given  
9 a transponder or "beeper" 57 that emits a characteristic  
10 signal in response to receipt of a beeper "command signal"  
11 transmitted from transceiver 58 to all beepers simultaneously  
12 by way of RF transmission (like a remote-controlled garage  
13 door opener). One way in which each beeper could be  
14 identified would be to have each beeper emit a selected  
15 characteristic (audio range or "ultrasonic") signal with a  
16 delay unique to each beeper following receipt of the beeper  
17 "command signal." Such return signals would then be detected  
18 by transceiver 58 which in turn would relay such information  
19 to data storage unit 40 under control of processor/controller  
20 44. The beeper command signals could be programmed to be  
21 transmitted, for example, at quarter-hour intervals to query  
22 which individual(s) are listening to a given receiver. The  
23 RMD 18 would then store in its memory information as to which  
24 beepers (i.e., individuals) the audience measurement data  
25 corresponds.

26 In use, the RMD is placed in physical proximity, i.e.,  
27 in the same house, same room or same vehicle as the primary  
28 monitored unit 12 and is powered either from a self-contained

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1 battery or from a local available source of power from the  
2 building or vehicle in which it is placed. The RMD has a  
3 serial number recorded within its data storage means 40 to  
4 allow identification of the unit and to allow correlation of  
5 its data with its intended user/location. The RMD determines  
6 the station to which the monitored unit 12 is tuned by  
7 "listening" to the sound emanating from the units speaker,  
8 and while listening, automatically determines the broadcast  
9 station frequency or channel to which the receiver is tuned.

10 As will be understood from the above, the illustrated  
11 preferred embodiment has the capability of determining the  
12 station to which a radio or television set is tuned without  
13 the use of any electrical or mechanical connection to the  
14 monitored receiver. Its only limitations are that it or a  
15 connected microphone be within "hearing" distance of the  
16 receiver and that its receiving antenna not be blocked in  
17 any way that would materially interfere with its receipt of  
18 the broadcast signals of interest. However, this is not to  
19 say that as a matter of convenience one could not substitute  
20 a plug for the microphone where the monitored receiver is  
21 provided with an appropriate earphone jack or other suitable  
22 audio output jack. The unit is self-contained, completely  
23 passive and operates on the same principal regardless of  
24 whether an AM radio, FM radio or a television receiver is  
25 being monitored. Moreover, it has the ability to determine  
26 the station to which the monitored receiver is tuned without  
27 requiring that the received station transmitter transmit any  
28 characteristic signal.

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1 Referring now to Fig. 2 of the drawing, the principal  
2 functional components of one embodiment of the audio signal  
3 detector 30 are depicted. These elements includes a phase  
4 delay circuit 60 for delaying the audio signal input on line  
5 28 so that it is time coincident with a corresponding audio  
6 signal input on line 22. The delay compensated for would  
7 normally be primarily that attributable to the time lost as  
8 a result of sound traveling the distance between monitored  
9 receiver 12 and microphone 20. Delay means 60 may be preset  
10 at a fixed value or may be of a type which dithers the phase  
11 on either side of a selected phase delay so as to  
12 automatically accommodate different distances between  
13 receiver and microphone. As indicated, the delayed signal  
14 may be squared in a squaring circuit 62 to facilitate its  
15 comparison and communicated via a line 64 to one input of a  
16 signal comparator 66. Comparator 60 might, for example be  
17 comprised of a synchronous detector, a lock-in amplifier, a  
18 phase detector, a difference amplifier, a signal correlator  
19 or correlation detector, etc., wherein the signal on line 64  
20 serves as the reference input to which the audio signal input  
21 on line 72 would be compared. The use of a synchronous  
22 detection means is preferable in that it has the ability to  
23 better exclude the unwanted effects of background noise in  
24 the audio input signal.

25 The audio input from microphone 20 on line 22 is first  
26 applied to an automatic gain control circuit (AGC) 68 which  
27 adjusts the gain of the signal to an acceptable level before  
28 it is input via a switch 70 into a second input 72 of

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1 comparator 66. If comparator 66 finds a match between the  
2 signals input on lines 64 and 72, it will develop an output  
3 on line 74 which is then "sampled and held" by a sample and  
4 hold circuit 76 and made ready for output on line 36a for  
5 input to processor 44.

6 It may be desirable to know the stations to which each  
7 of several receivers within a given household are tuned.  
8 This can be accomplished as indicated in Fig. 3. The several  
9 household receivers, including a primary or "local" receiver  
10 90 and a plurality of remote receivers 92, can be monitored  
11 by as few as one RMD 94 placed in some centralized location.  
12 The RMD 90 listens to the receivers in a given household via  
13 remote microphones 94 installed into each room in which a  
14 receiver could be placed. Such microphones transmit their  
15 received audio signals to RMD 94 through any suitable signal  
16 connecting means 98 such as, for example, an intercom  
17 connected to and powered by the household AC wiring. The  
18 output of each remote microphone is then multiplexed into the  
19 RMD using a suitable multiplexing means 100, the multiplex  
20 "switch" position being indicative of which room the  
21 corresponding microphone 96 is placed.

22 The above described elements constitute the basic  
23 circuit components used to detect the frequency (radio  
24 station or TV aural channel) at which the monitored receiver  
25 12 (Fig. 1) is currently set. However, as previously  
26 indicated, in the case of units monitoring a receiver carried  
27 in a mobile unit such as an automobile, truck or camper, it  
28 may be desirable to determine when the mobile unit has

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1 "visited" or at least been in the immediate vicinity of a  
2 particular commercial outlet or other facility, such as a  
3 fast food restaurant, auto dealership or other advertising  
4 establishment or location. This can be accomplished using  
5 the present invention by providing at each outlet to be  
6 identified, a low power RF transmitter which broadcasts at  
7 a predetermined frequency, with each outlet having a  
8 dedicated tone modulated onto its carrier. This tone can  
9 either be a particularly selected single frequency tone  
10 either continuously broadcast or pulsed in some specific  
11 manner, or can be a selected pattern of different tones  
12 uniquely identifying the particular outlet.

13 It will be appreciated that when the mobile unit is  
14 within signal range of the outlet, scanning receiver 24 will  
15 detect the carrier frequency as it is stepped across the band  
16 including that carrier frequency under control of  
17 processor/controller 44, and in a manner similar to the  
18 processing of a broadcast signal will demodulate the detected  
19 signal and cause the identifying audio tone to be generated  
20 on line 28 (Fig. 1). In order to detect and identify this  
21 tone, several alternative methods can be used. As one  
22 example, the detector 30 might be provided with a selectable  
23 tone generator 80 which, under control of processor 44 via  
24 line 82, will sequentially generate a sequence of tone  
25 signals including that assigned to the outlet 54, and will  
26 output such signals on line 84 for input to the second input  
27 72 of comparator 66 via switch 70.

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1       At the same time that tone generator 80 is activated by  
2   a signal developed by controller 44 on line 82, switch 70  
3   would be switched in response to a signal developed on a  
4   control line 86 by controller 44, from its first position  
5   connecting the signal from microphone 20 into comparator 66  
6   to a second position connecting tone generator 80 to input  
7   72. As in the previously explained case where the compared  
8   audio signal was from microphone 20, comparator 66 would in  
9   this instance compare the outlet transmitter signal input on  
10   line 64 to the tone generator signal developed on line 84 and  
11   coupled into line 72, and when parity is found would generate  
12   an identifying output on line 74 for input through sample and  
13   hold circuit 76 and line 32a to data storage 40 (Fig. 1)  
14   under control of controller 44.

15       As another example, the tone generator 80 would not be  
16   used and controller 44 would be programmed to not look for  
17   a match signal and on line 32a and would instead look only  
18   to see if an output was present on line 32c. During the  
19   intervals within which receiver 24 is tuned to an outlet  
20   transmitter frequency, the presence of an output from signal  
21   level detector 92 would merely indicate that a signal was  
22   received from a particular outlet transmitter and from such  
23   information, it could be inferred that the RMD was within  
24   the range of reception of the particular outlet transmitter.  
25   The occurrence of this "event" would then cause that  
26   locations identity together with the associated date and time  
27   information to be stored in memory unit 40 for subsequent  
28   retrieval and possible correlation with previously broadcast



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1 advertising if, or when, desired.

2 It will be appreciated that such outlet proximity  
3 identifying information when combined with the date and time  
4 information will provide useful information when correlated  
5 with the monitored receiver listening information. For  
6 example, it might be of interest to note that within a  
7 particular period of time following the broadcast and  
8 detected listening to of a particular advertisement on  
9 receiver 12, the mobile unit carrying unit 12 appeared at an  
10 outlet identified in the advertisement.

11 In addition to the above-mentioned features, audio  
12 detector 30 may also have the ability to determine those  
13 times during which the listener is not listening to broadcast  
14 signals but is instead listening to other music or other tape  
15 recorded matter. In accordance with the present invention,  
16 such information can be obtained by amplifying the audio  
17 input detected by microphone 20 using a gain stage 88  
18 together with either a low pass or high pass filter 90 which  
19 blocks normal oral conversation frequencies and passes only  
20 signals likely to come from recorded music for example. It  
21 will be appreciated that the presence of a signal appearing  
22 on line 32b in the presence of a signal appearing at the  
23 output of squaring circuit 62, as detected by a suitable  
24 signal level detector 92 and communicated to controller 44  
25 via line 32c, but with no match found after several sampling  
26 sweeps, will indicate that even though no match was detected  
27 there was in fact music or other non-verbal sound being  
28 generated in the vicinity of microphone 20. Furthermore,

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1 where no appropriate sound is detected in the vicinity of  
2 microphone 20, these same device components could be used to  
3 indicate to controller 44 that the device should be placed  
4 in a "standby mode" and controller 44 could, in response,  
5 actuate appropriate powerdown circuits to conserve energy  
6 until sounds of interest are again present.

7 A battery powered RMD can also be used to monitor  
8 portable receivers. For example, an RMD can "listen" to  
9 radios/TVs at a particular gathering of people such as at a  
10 beach if someone carries the unit around on their persons  
11 and can thereby determine the number distribution of stations  
12 being listened/tuned to by the persons in attendance.

13 Although the present invention has been described above  
14 in terms of a particular preferred embodiment, it is to be  
15 understood that additional features, alternatives and  
16 modifications of the described embodiment will be apparent  
17 to those skilled in the art after having read this  
18 disclosure. It is therefore intended that the scope of the  
19 appended claims not be limited by such disclosure but that  
20 such claims be interpreted broadly to cover all such matter  
21 as falls within the true spirit and scope of the invention.

22 What is claimed is:

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IN THE CLAIMS

1 1. Broadcast media audience measurement apparatus for  
2 placement within sonic communication range of at least one  
3 monitored broadcast receiver comprising:

4 broadcast signal receiving means scannable over a  
5 predetermined frequency band including identifiable broadcast  
6 carrier frequencies and operable to briefly tune to and  
7 develop a first signal corresponding to the audio information  
8 contained within each selected broadcast frequency;

9 microphone means responsive to sonic energy input  
10 thereto from said monitored broadcast receiver and operative  
11 to generate a corresponding second signal;

12 detector means for comparing said first and second  
13 signals and for developing a match signal when said first  
14 signal is equivalent to said second signal;

15 clock/calendar means for generating date and time  
16 signals corresponding to each said match signal;

17 data storage means; and

18 processor/controller means for causing said broadcast  
19 signal receiving means to step from one identifiable  
20 broadcast frequency to another within said predetermined  
21 frequency band, and in response to said match signal being  
22 operative to cause information including a broadcast  
23 frequency identifying signal and corresponding date and time  
24 signals to be stored in said data storage means.

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1 2. Broadcast media audience measurement apparatus as  
2 recited in claim 1 and further comprising data communication  
3 means under control of said processor/controller means and  
4 operative to output information stored in said data storage  
5 means.

1 3. Broadcast media audience measurement apparatus as  
2 recited in claim 2 wherein said data communication means  
3 includes means for coupling such information into a telephone  
4 line.

1 4. Broadcast media audience measurement apparatus as  
2 recited in claim 2 wherein said data communication means  
3 includes means for coupling said information to an external  
4 data storage means.

1 5. Broadcast media audience measurement apparatus as  
2 recited in claim 2 wherein said data communication means  
3 includes means for communicating said information to an  
4 electro-magnetic wave transmission medium.

1 6. Broadcast media audience measurement apparatus as  
2 recited in claim 1 wherein said signal detector means  
3 includes signal delay means for time delaying said first  
4 signal sufficient to bring it in to time coincidence with a  
5 corresponding second signal.

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1 7. Broadcast media audience measurement apparatus as  
2 recited in claim 1 and further comprising selectable tone  
3 generator means for generating a third signal having  
4 predetermined characteristics identifying a particular  
5 carrier frequency within said band, and means under control  
6 of said processor/controller means for coupling said third  
7 signal to said detector means in place of said second signal  
8 whereby the detection of a particular source of carrier  
9 frequency identified by said third signal can be signified  
10 independent of any sonic input into said apparatus.

1 8. Broadcast media audience measurement apparatus as  
2 recited in claim 7 whereby means are provided for inferring  
3 from the said identification that said apparatus is within  
4 a determinable proximity of said source when it is known that  
5 the identified source has a limited broadcast range.

1 9. Broadcast media audience measurement apparatus as  
2 recited in claim 1 and further including signal level  
3 detector means responsive to said first signal and operative  
4 to generate a signal indicating to said processor/controller  
5 means that a signal from a particular broadcasting source  
6 known to be the sole broadcaster at the selected frequency  
7 has been detected, whereby if the source has a limited  
8 broadcast range, detection of such signal indicates that said  
9 apparatus is within a determinable proximity of said source.

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1 10. Broadcast media audience measurement apparatus as  
2 recited in claim 1 and further comprising transceiver means  
3 operating under control of said processor/controller means  
4 for generating a signal in the vicinity of a monitored  
5 broadcast receiver which will activate audience member  
6 carried transponding means which in turn will return member  
7 identifying signals for detection by said transceiver means.

1 11. Broadcast media audience measurement apparatus as  
2 recited in claim 10 wherein said transceiver means generates  
3 a command signal for simultaneously actuating all said  
4 transponding means within a predetermined range thereof and  
5 subsequently identifies the source of each returned member  
6 identifying signal as a function of some predetermined  
7 characteristic thereof.

1 12. Broadcast media audience measurement apparatus as  
2 recited in claim 11 wherein each said transponding means is  
3 caused to generate a return signal at a different  
4 predetermined time following receipt of said command signal,  
5 and wherein said transceiver means identifies the source of  
6 a particular return signal as a function of its time of  
7 detection.

1 13. Broadcast media audience measurement apparatus as  
2 recited in claims 1, 10, 11 or 12 wherein said microphone  
3 means including a plurality of remotely located microphones  
4 and a multiplexing means for sequentially inputting second

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5 signals from each said microphone into said detector means  
6 for comparison to each said first signal.

1 14. A method of measuring broadcast media audience  
2 participation comprising the steps of:

3 detecting sonic energy developed by at least one  
4 particular broadcast receiver and generating a corresponding  
5 first signal;

6 detecting in sequence a plurality of broadcast signals  
7 within the range of receipt by said receiver and generating  
8 a second signal corresponding to each broadcast signal  
9 detected;

10 comparing each said second signal to said first signal  
11 and generating broadcast signal identifying information and  
12 date and time information corresponding to each occurrence  
13 of a match between said first signal and said second signal.

1 15. A method as recited in claim 14 and further comprising  
2 the steps of storing said information and periodically  
3 communicating the stored information to a remote user.

1 16. A method as recited in claim 14 and further comprising  
2 the steps of detecting the receipt of a broadcast signal  
3 broadcast from a source known to have a limited range and  
4 determining therefrom that the detecting entity was within  
5 a determinable proximity of the source at a particular date  
6 and time.

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1 17. A method as recited in claim 14 and further comprising:  
2 generating a command signal for actuating audience  
3 member carried transponder means;  
4 receiving return signals generated by said transponder  
5 means; and  
6 using the received returned signals to signify the  
7 presence of particular members in the vicinity of said  
8 particular broadcast receiver.

1 18. A method of measuring broadcast media audience  
2 participation comprising the steps of:  
3 detecting the audio output developed by at least one  
4 particular broadcast receiver and generating a corresponding  
5 first signal;  
6 detecting in sequence a plurality of broadcast signals  
7 received by said receiver and generating a second signal  
8 corresponding to each broadcast signal detected; and  
9 comparing each said second signal to said first signal  
10 and generating broadcast signal identifying information and  
11 date and time information corresponding to each occurrence  
12 of a match between said first signal and said second signal.



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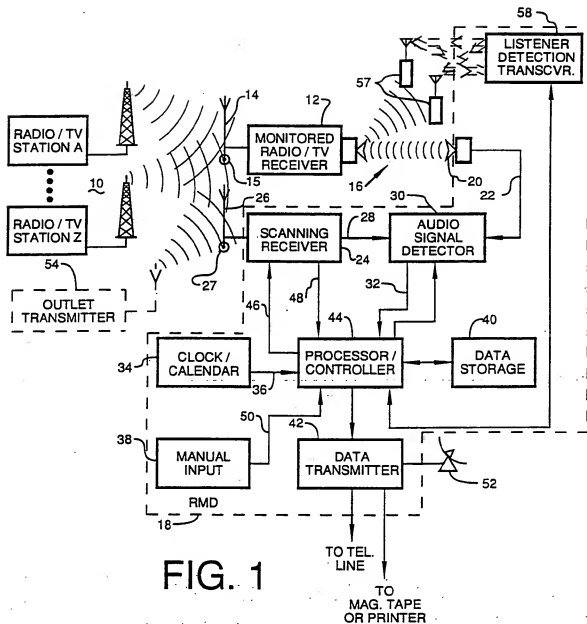


FIG. 1

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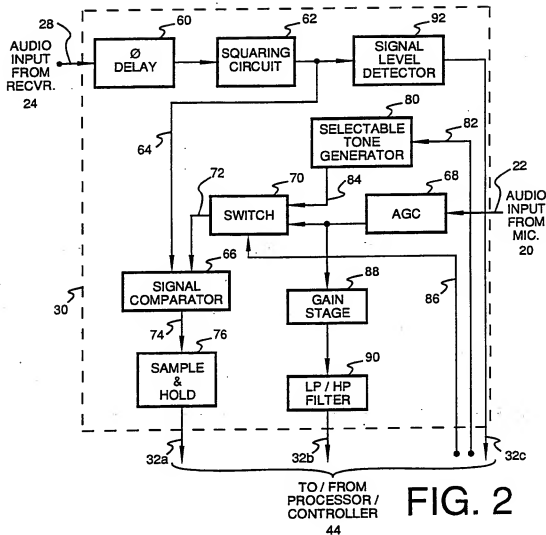


FIG. 2

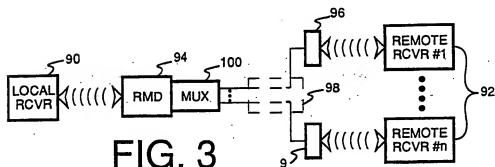
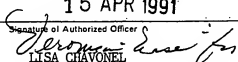


FIG. 3

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# INTERNATIONAL SEARCH REPORT

International Application No. **PCT/US91/00310**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> In several classification symbols apply, indicate all <sup>1</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC IPC(5): H04B 17/00 H04H 9/00 US CL.: 455/2,67 358/84		
<b>II. FIELDS SEARCHED</b>		
Classification System		Minimum Documentation Searched <sup>2</sup> Classification Symbols
US	455/2,67 358/84	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>3</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>4</sup></b>		
Category <sup>5</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X Y	US, A, 4,955,070 (WELSH et al.) 04 September 1990 See entire document.	1-4, 14-15, 18 5-6 and 9-17
Y	US, A, 4,626,904 (LURIE) 02 December 1986 See column 1.	10-12 and 17
Y	US, A, 3,803,349 (WATANABE) 09 April 1974 See figure 1.	13
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>*</sup> Special categories of cited documents: <sup>10</sup></p> <p><sup>"A"</sup> document defining the general state of the art which is not considered to be of particular relevance</p> <p><sup>"E"</sup> earlier document but published on or after the international filing date</p> <p><sup>"L"</sup> document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p><sup>"O"</sup> document referring to an oral disclosure, use, exhibition or other means</p> <p><sup>"P"</sup> document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p><sup>"T"</sup> later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p><sup>"X"</sup> document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p><sup>"Y"</sup> document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p><sup>"&amp;"</sup> document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <b>09 MARCH 1991</b>		Date of Mailing of this International Search Report <b>15 APR 1991</b>
International Searching Authority <b>ISA/US</b>		Signature of Authorized Officer  <b>LISA CHAVONEL</b>

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